620°C. Plate A had a uniform fine recrystallized grain structure. Plate B had a coarse grained lath alpha-zirconium microstructure in part of the plate thickness and a recrystallized grain structure in the remainder. Zircaloy-2 has a low volume fraction of second phase particles that contribute to the plastic deformation behavior and corrosion resistance of the alloy. The mean second phase particle diameter of Plate A was 0.20μm. The mean second phase particle diameter of Plate B was 0.075μm.

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IN THE CLAIMS

Please rewrite claims 1-7 and 18-35 as follows:

C2

1. (Amended) A creep resistant zirconium-based alloy for use in nuclear fuel cladding, wherein the zirconium-based alloy comprises a coarse grained lath alpha microstructure, and wherein the zirconium-based alloy comprises a middle annular layer in the cladding disposed between an inner annular layer in the cladding and an outer annular layer in the cladding.

2. (Twice Amended) The zirconium-based alloy as claimed in claim 1 wherein the microstructure comprises second phase precipitates.

3. (Twice Amended) The zirconium-based alloy as claimed in claim 2 wherein the second phase precipitates have a diameter less than about 0.15μm.

4. (Amended) The zirconium-based alloy as claimed in claim 3 wherein the microstructure is partially recrystallized.

5. (Amended) The zirconium-based alloy as claimed in claim 4 wherein the microstructure is less than 50% recrystallized.

6. (Twice Amended) The zirconium-based alloy as claimed in claim 1 wherein the microstructure has an acicular structure comprising a lath spacing within the range from about 0.5μm to about 3.0μm.

7. (Twice Amended) The zirconium-based alloy as claimed in claim 5 wherein the microstructure is an acicular structure and comprises a lath spacing within the range from about 0.5μm to about 3.0μm.

18. (Amended) The zirconium-based alloy as claimed in claim 2 wherein the second phase precipitates have a diameter less than about 0.10μm.

19. (Amended) The zirconium-based alloy as claimed in claim 2 wherein the second phase precipitates have a mean particle diameter of about 0.075μm.

20. (Amended) The zirconium-based alloy as claimed in claim 2 wherein the second phase precipitates comprise at least one of Fe and Cr.

21. (Amended) A creep resistant zirconium-based alloy for use in nuclear fuel cladding, said alloy comprising a coarse grained lath alpha microstructure, said alloy comprising approximately 1.2-1.7 weight percent Sn, approximately 0.13 to less than 0.20 weight percent Fe, approximately 0.06-0.15 weight percent Cr, approximately 0.05-0.08 weight percent Ni, and the balance being substantially zirconium, said alloy having been subjected to a predetermined treatment, and said alloy comprising a middle annular layer in said cladding disposed between an inner annular layer in the cladding and an outer annular layer in the cladding.

22. (Amended) The creep resistant zirconium-based alloy of claim 21, wherein the predetermined treatment comprises:

beta heat treating a zirconium-based alloy to form a first intermediate;

fast quenching the first intermediate to form a second intermediate;

cold working the second intermediate to form a third intermediate; and

annealing the third intermediate to effect partial recrystallization of the microstructure.

23. (Amended) The creep resistant zirconium-based alloy of claim 22, wherein the cold working step further comprises cold working the second intermediate within the range from about 30% to about 40% to form the third intermediate.

24. (Amended) The creep resistant zirconium-based alloy of claim 22, wherein the cold working step further comprises cold working the second intermediate about 36% to form the third intermediate.

25. (Amended) The creep resistant zirconium-based alloy of claim 22, wherein the beta heat treating step occurs at a temperature above about 965°C.

26. (Amended) The creep resistant zirconium-based alloy of claim 22, wherein the beta heat treating step has a duration of from about 1 second to about 10 seconds.

27. (Amended) The creep resistant zirconium-based alloy of claim 22, wherein the fast quenching step is conducted at a cooling rate within the range from about 20°C/second to about 200°C/second.

28. (Amended) The creep resistant zirconium-based alloy of claim 22, wherein the annealing step is conducted within the temperature range of from about 570°C to about 640°C.

29. (Amended) The creep resistant zirconium-based alloy of claim 22, wherein the annealing step is conducted at about 620°C for about 3 hours.

30. (Amended) A creep resistant zirconium-based alloy for use in nuclear fuel cladding, said alloy comprising a coarse grained lath alpha microstructure comprising

C3

second phase precipitates, wherein the microstructure of the alloy is partially recrystallized after being subjected to a treatment comprising beta heat treating the alloy to form a first intermediate, fast quenching the first intermediate to form a second intermediate, cold working the second intermediate to form a third intermediate, and then annealing the third intermediate to effect partial recrystallization of the microstructure, wherein the alloy comprises a middle annular layer in the cladding disposed between an inner annular layer in the cladding and an outer annular layer in the cladding.

31. (Amended) The creep resistant zirconium-based alloy of claim 30, wherein the second phase precipitates have a diameter less than about 0.15μm.

32. (Amended) The creep resistant zirconium-based alloy as claimed in claim 30, wherein the second phase precipitates have a mean particle diameter of about 0.075μm.

33. (Amended) The creep resistant zirconium-based alloy as claimed in claim 30, wherein the second phase precipitates comprise at least one of Fe and Cr.

34. (Amended) The creep resistant zirconium-based alloy of claim 30, wherein the microstructure is less than 50% recrystallized.

35. (Amended) The creep resistant zirconium-based alloy of claim 30, wherein the microstructure has a acicular structure comprising a lath spacing within the range from about 0.5μm to about 3.0μm.

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Please add new claims 36-41 as follows:

C4

36. (New) The creep resistant zirconium-based alloy of claim 1, wherein the inner annular layer in the cladding comprises a zirconium barrier layer.